ORIGINAL RESEARCH ARTICLE

A STUDY ON THE PREVALENCE AND FREQUENCY RATES OF IRON DEFICIENCY ANEMIA AMONG PATIENTS IN EL. KHORMA PROVINCE, WESTERN SAUDI ARABIA

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Abstract: The objective of this study is to investigate the prevalence and frequency rates of iron deficiency anemia among patients attending to a large special medical clinic called Al. Elaj in El. Khorma Province, Western Saudi Arabia. A total of 300 blood specimen of patients 83.3% females and 16.6% males, all aged (18-44 years), were examined for complete blood count (CBC), hemoglobin and hematocrit levels, iron profile and the hemoglobin electrophoresis. Based on hemoglobin levels, the prevalence of iron deficiency anemia was 34.7 % (33% females and 1.7% males). For the two groups of the study, mainly the iron deficiency anemia was found. By severity of anemia, mild anemia showed the highest prevalence (63.5%) followed by moderate anemia (25.9%) and severe anemia (10.6%). According to age groups, the highest prevalence of iron deficiency anemia was found in (27-35) age group which was being (41.3 and 4.8%) in females and males respectively, with statistically significant difference between females and males ($p < 0.05$). In the mean hemoglobin and hematocrit levels in anemia cases, the highest mean value was recorded in males being (10.23±1.3) and (34.8±4.09) for hemoglobin and hematocrit respectively. Mean (±SD) value for red blood cells (RBC), serum iron, serum ferritin and Total Iron Binding Capacity (TIBC) in anemic cases were (4.17±0.4, 4.6±0.29), (31.6±4.7, 37.25±1.7), (10.7±4.6, 33.27±7.5) and (363.4±41.3, 358.8±44.8) in females and males respectively. Thus, the results of this study illustrated that iron deficiency anemia is highly prevalent (34.7%) among adults, especially in females (33%) in the study area.

Key Words: Prevalence; Iron Deficiency Anemia; Patients; Hemoglobin; Hematocrit; El.Khorma Province

INTRODUCTION

Iron deficiency anemia is one of most prevalent nutritional diseases in many parts of the world. Iron deficiency is the main cause of anemia; therefore anemia prevalence can be used as a proxy for prevalence of iron deficiency anemia [1]. It is a world health problem for all age groups and both sexes which is caused by many factors, including deficiency of iron in the diet, inadequate iron absorption from the gut, chronic diseases such as ulcer or tuberculosis, excessive menstrual losses and loss of blood because of parasites [2]. The prevalence of anemia as a public health problem is categorized as follows: < 5% no public health problem; 5-19.9% mild public health problem; 20-39.9% moderate public health problem and ≥ 40% severe public health problem [3]. Anemia was defined as a hemoglobin concentration of the blood values would ≤ 13 g/dl in adult males and ≤ 11 g/dl in adult females. According to hematocrit level, iron deficiency anemia was defined with level < 41-47% for females and males respectively [4, 5, 6]. The prevalence of anemia in Saudi Arabia is effected particularly in women and children [7, 8]. The prevalence of iron deficiency anemia was 40.5 and 40% among school girls and childbearing age women respectively in Riyadh town [9, 10]. A survey conducted in Jeddah among female elementary school showed the prevalence of iron deficiency anemia was 23% [11]. In Al.Hada area, Taif Province, a study carried out in school children showed that the overall prevalence was 11.6% and 15.5% [12]. In King Abdulaziz University in Jeddah the prevalence of anemia was 23.9% in female students [13]. In 2012 another study showed that the overall prevalence of iron deficiency anemia in Riyadh Region was the overall prevalence of iron deficiency anemia was 22.3% [14].

MATERIALS AND METHODS

Study design

Analytical, descriptive and laboratory survey analysis of blood specimens was conducted to determine the prevalence of anemia among the patient who attend to El.Elaj health clinic in the study area between August to December 2014. A total of 300 blood samples of adult patients who have diagnosed as anemic patient and agreed to participate in the study were investigated for anemia disease. The samples comprising 250 of non-pregnant females and 50 males, all groups were Saudi and aged about (18- 44 years). The venous blood specimens of the patients were examined for complete blood count (CBC), hemoglobin and hematocrit levels, iron profile and hemoglobin electrophoresis to differentiate the other hypochromic anemias from iron deficiency anemia. The age, sex and other needed information about the patient were recorded by the doctors and technicians in the health clinic. Iron deficiency anemia was defined according to WHO hemoglobin levels in adults (≤ 13 g/dl in adult males and ≤ 11 g/dl in adult females), [4].

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Blood sample collection and examination

Blood sample of 5ml was collected from each participant by venue puncture into ethylene diamine tetra–acetic acid (EDTA) vacuum tubes for hemoglobin and hematocrit determination. The blood samples were taken for complete blood count including hemoglobin, red blood cells, hematocrit, serum ferritin and hemoglobin electrophoresis. The EDTA blood sample was tested and analyzed by the laboratory technologist using the Sysmex Kx 21N, fully automated hematology analyzer.

The cut-off value for the determination of iron deficiency anemia is blood Hb concentration (≤ 13 g/dl in adult males and ≤ 11 g/dl in adult females), [4]. The severity of anemia is classified into three stages: mild (≤ 10 g/dl, ≤ 11.5 g/dl), moderate (≤ 9.5 g/dl, ≤ 11 g/dl) and severe (≤ 9 g/dl, ≤ 10.5 g/dl) in adult females and males respectively [4].

Statistical analysis

Data analysis was carried out using a statistical package programme. Data was fed into a Microsoft Excel table which was used to construct the tables. The Statistical Package for Social Sciences (SPSS) was then used to form all the statistical analysis. The association between the categories was tested for significance using chi-square test, and p values less than 0.05 was considered significant.

RESULTS

A total of 300 Saudi adults were included in this study, aged ranged between 18-44. Out of the total samples, 250 (83.3%) were females and 50 (16.6%) were males. All participants EDTA samples were subjected to CBC analysis and hemoglobin electrophoresis to classify the type of anemia. In all the samples, mainly iron deficiency anemia was found in the anemic cases. Looking at overall CBC results, participants were defined into two groups' females and males. The prevalence rate for iron deficiency anemia in all samples was 34.7 % (33% in females and 1.7% in males), (Table 1). This result was depended on as the World Health Organization cutoff value for anemia, which was considered to be Hb ≤ 11.0 g/dl and Hb ≤ 13.0 g/dl for females and males respectively. For all groups of the study the only anemia was found is iron deficiency anemia. The frequency and severity of anemia results divided participants into three groups mild, moderate and severe anemia as shown in (Table 2). By severity of anemia, mild anemia showed the highest prevalence (63.5%) followed by moderate anemia (25.9%) and severe anemia (10.6, %), (Table 2). According to age groups, the highest prevalence of iron deficiency anemia was found in (27-35) age group which was being (41.3 and 4.8%) in females and males respectively

(Table 3). In the mean hemoglobin and hematocrit levels in anemia cases, the highest mean value was recorded in males being (10.23±1.3) and (34.8±4.09) for hemoglobin and hematocrit respectively (Table 4). Mean (±SD) value for red blood cells (RBC), serum iron, serum ferritin and Total Iron Binding Capacity (TIBC) in anemic cases were (4.17±0.4, 4.6±0.29), (31.6±4.7, 37.25±1.7), (10.7±4.6, 33.27±7.5) and (363.4±41.3, 358.8±44.8) in females and males respectively as shown in Table 6.

Table 1: The overall prevalence of iron deficiency anemia in the study area (n=300)

Number examined	Females (Prev. %)	Males (Prev. %)	Total (Prev. %)
300	99 (33)	5 (1.7)	104 (34.7)

Table 2: The severity of iron deficiency anemia in all cases according to sex in the study area (n=104)

Severity of anemia	Females	Males	Total
Mild anemia	61 (58.6 %)	5 (4.8 %)	66 (63.5 %)
Moderate anemia	27 (25.9 %)	0 (0 %)	27 (25.9 %)
Severe anemia	11 (10.6 %)	0 (0 %)	11 (10.6 %)

*Statistical analysis $P = 0.0076$ $P < 0.05$ significant difference between the severity of anemia cases according to sex

Table 3: The severity of iron deficiency anemia in all cases according to age, in the study area (n=104)

Sex	Females			Males		
Age groups	18-26	27-35	36-44	18-26	27-35	36-44
Mild anemia	16 (15.3%)	43 (41.3%)	2 (1.9%)	0 (0)	5 (4.8%)	0 (0)
Moderate anemia	9 (8.7%)	18 (17.3%)	0 (0)	0 (0)	0 (0)	0 (0)
Severe anemia	4 (3.8%)	7 (6.7%)	0 (0)	0 (0)	0 (0)	0 (0)
Total	29(27.9%)	68(65.4%)	2(1.9%)	0(0)	5(4.8%)	0(0)

*Statistical analysis $P = 0.003$ $P < 0.05$ significant difference between the severity of anemia cases in age groups

Table 4: Mean (M ± SD) of hemoglobin, hematocrit concentration of iron deficiency anemia cases according to sex

Concentration	Females	Males	*P-value
Hemoglobin	10.01± 0.01	10.23 ± 1.3	0.001
Hematocrit	31.97 ± 3.34	34.8 ± 4.09	0.003

*T-test, significance ($P < 0.05$)

Table 5: Mean (M ± SD) of hemoglobin, hematocrit concentration of iron deficiency anemia cases according to age

Concentration	Females			Males			*P-value
Age groups	18-26	27-35	36-44	18-26	27-35	36-44	
Hemoglobin	9.7 ± 1.3	9.8 ± 1.3	10.2 ± 1.2	0	10.01 ± 0.9	0	0.072
Hematocrit	31.1 ± 3.8	31.9 ± 3.3	34.8 ± 4.1	0	31.9 ± 3.3	0	0.023

*T-test, significance ($P < 0.05$)

Table 6: Mean (M ± SD) of Red Blood Count (RBC), Serum iron, Serum feriritin and Total Iron Binding capacity (TIBC) concentration of iron deficiency anemia cases in all groups of the study

Concentration	Females	Males	*P-value
RBC (106/mm3)	4.17 ± 0.42	4.26± 0.29	0.001
S. Iron (µmol/L)	31.6 ± 4.7	37.25 ± 1.7	0.001
S. Ferritin (µg/L)	10.7 ± 4.6	33.27 ± 7.5	0.003
TIBC (µmol/L)	363.4 ± 41.3	358 ± 44.8	0.001

***T-test, significance** (P < 0.05)*

DISCUSSION

The purpose of this study to assess the prevalence of iron deficiency anemia in the patients attending to El.Elaj health clinic for medical examination in El.Khorma Province, Saudi Arabia. Worldwide, the prevalence of iron deficiency anemia varies according to different conditions, including many parasitic diseases and other infections, consumption of highly refined foods, lower intake of iron-rich food, particularly vegetables and gastrointestinal disorders, leading to impaired iron absorption. In this study, the overall prevalence of iron deficiency anemia in the study area was 34.7%, when anemia defined as if Hb ≤ 11 and Hb ≤ 13 for females and males respectively. This small research showed that mainly cases of anemia are iron deficiency anemia, this result confirmed with other studies [9, 10, 13,14], a few studies had been found the majority of anemia cases were normocytic anemia [11]. However, many studies were reported that iron deficiency anemia is common in Saudi Arabia, ranging from 30% to 56% [15], especially in non-pregnant women of childbearing age [16]. In this study, the prevalence of iron deficiency anemia was higher in females (33%), compared to males (1.7%) group. This mainly due to the worldwide prevalence of iron deficiency anemia in females and the small size of male samples that attending to this health clinic during the study period. These findings are consistent with other local and regional studies that reported higher prevalence in females [13,14, 17, 18]. This was explained by the fact that, the heavy menstrual blood loss is an important risk factor for iron deficiency anemia among women of childbearing age. Total body iron stores contain about 2-4g, with substantial differences between the females and males. Males and non-menstruation females average a 1 mg loss of iron per day. A typical 60 kg woman may lose an additional 10 mg of iron per day during menstruation. Iron loss of 42 mg per menstrual cycle has been reported in females with heavy blood flow [19]. According to the severity of anemia, the prevalence of severe anemia (≤8 g/dL) are much less (10.6, 0%) in females and males respectively. In contrast, the mild anemia (≤11 g/dL) was recorded the highest prevalence (58.6, 4.8%) in females and males respectively with significantly different between the three types. These findings were in agreement with other previous studies showing that mild anemia is the highest prevalent type of anemia [20, 21]. Mild iron deficiency anemia, mainly due to diminished iron storage, occurs long before anemia develops, and requires early diagnosis and intervention to prevent the development of full-blown symptoms of iron deficiency. Prevention in the early mild stages can help in reducing the future burden of moderate and severe anemia [10]. In this study, the mean of hemoglobin and hematocrit values in the anemic female group had significant low values (10.01±0.1 and 31.97±3.34) respectively, than anemic males (10.23±1.3 and 34.80±4.09), paralleled with other studies in Kingdom Saudi Arabia [10, 11, 13]. The lack of iron supply for hemoglobin formation that leads to the development of anemia and inadequate intake of iron rich food should be considered as contributing factors. The current iron-folate supplementation program for pregnant women should be expanded to non-pregnant women. According to the age groups, the age group of 27-35 was recorded high prevalence in females and males being (41.3, 4.8%) respectively. This result was accepted with most studies in Saudi Arabia. The total hemoglobin and hematocrit levels were low in females at age 18-26 years group, but from then onwards increased up to the ≥ 35 years. The data for RBC, S. Iron, S. Ferreting and TIBC in anemic cases was showed significantly decreased in females compared with males. Results of decreasing in these parameters in females similar to what had been reported by El.Hazmi [22] and Ghafouri [23].

In conclusion, this study revealed the prevalence of iron deficiency anemia among patient attending El.Elaj medical clinic was (34.7%), an apparently healthy problem especially in females at childbearing stage. Intervention action programs to combat iron deficiency anemia in Saudi Arabia should be given a high priority.

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